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To: Examiner John Lee, Group Art Unit 2501

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PATENT
Docket No. 47958USA1A

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Group Art Unit: 2501
ROGER H. APPELDORN, ALAN HULME-LOWE, and MICHAEL LEA	Examiner: John Lee
Application No. 07/963,056 Filed: October 19, 1992	
For: ILLUMINATION DEVICES AND OPTICAL FIBRES FOR USE THEREIN	

COMMUNICATION

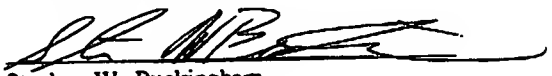
Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

As I promised on the telephone, I am attaching a copy of the English translation of Japanese Kokai 53-29740. I am unable to certify the accuracy of this translation, but to the best of my knowledge it is correct.

I look forward to meeting with you on Friday, July 22 at 1:00.

Respectfully submitted,



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Enclosure

JAPANESE PATENT OFFICE
PATENT KOKAI PUBLICATION
PATENT KOKAI NO. SHO 53[1978]-29740

Int.Cl.[2]	ID Nos.	Japan Cl. Nos.	Sequence Nos. for Office Use
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Application No. : Sho 51[1976]-104044

Application Date : August 31, 1976

Kokai Publication Date : March 20, 1978

No. of Inventions : 1 (Total 3 pages in Japanese original)

Examination request : Not requested

TITLE: LIGHT BRANCH AND CONNECTING CIRCUIT BY USE OF OPTICAL FIBER
(Hikari faibar o mochiita hikari bunki. ketsugo kairo)

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Amendments: There are no amendments to this patent.

[note: All names, addresses, company names, and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified with numeral prefix or general form of plurality suffix. Please also note that there are much vague ambiguities in this original patent. translator's note]

TITLE OF THE INVENTION: Light branch and connecting circuit by use of optical fiber

CLAIMS

A light branch and connecting circuit by use of optical fiber has characteristics as such that a V-form cleavage comprising a perpendicular plane that cross an axis of optical fiber orthogonally and an inclined plane that is in incline to this is formed at extended part of optical fiber with a clad layer around core body , and said cleavage has a depth that reaches said core body from outer circumference plane of said optical fiber, and this carries out branching of light in such manner so a part of incidental lights that enters said optical fiber from one end of above-explained optical fiber side is reflected at inclined plane of said V-form cleavage and is guided outside of above-explained optical fiber while the other portion surpass the position of above-explained V-form cleavage , and is guided to the other end side of above-explained optical fiber, or carries out connection of light in such manner so the incidental lights that enters from outside toward inclined plane of above-explained V-form cleavage is reflected at said inclined plane and is guided toward either one end or the other end of above-explained optical fiber.

DETAILED EXPLANATION OF THE INVENTION

The present invention relates to a light branch and connecting circuit by use of optical fiber with a clad layer around a core body.

A conventional light branch and connecting circuit of this type is generally constructed in following manner: it is designed to branch incidental lights that enters ONE optical fiber to other optical fibers in such manner that the lights that enter one end of said ONE optical fiber are discharged from the other end of said optical fiber and is passed through ONE lens while part of such lights that is given through said ONE lens are reflected with a half mirror that is inclined against axis of optical fiber (generally at about 45^{o} incline) to pass through other lens to reach other optical fibers, while the other part [of said lights] passes through half mirror and other lens and is guided to further other optical fibers; and it is designed to connect lights that enter optical fibers toward half mirror on optical fiber in such manner that part of the light that enters from outside through ONE lens toward half mirror that is inclined against axis of said ONE lens is reflected, and reaches ONE optical fiber through other lens while other portion passes through half mirror and is guided to other optical fibers through other lens.

However, according to such constitution, it requires a strict adjustment of relative positioning of optical fiber, lens, and half mirror to lead to not only much cumbersome adjustment, but also requires a lens and a half mirror besides optical fiber in addition to space for these arrangement to show a defect of increase in dimension of total circuit.

The present invention proposes new type of light branch.connecting circuit by use of optical fiber without defects explained above; and this is further clarified with explanation of application example in reference to attached Figures.

Figures 1 through 3 show one example of the present invention; and it shows a constitution that optical fibers (3A) and (3B) each having core (1) and clad layer (2) around this are aligned with their axis corresponding mutually as one integrated body. In this case, although optical fiber (3A) is formed of a perpendicular plane (4a) that is an end plane opposite side to that optical fiber (3B) side and crosses axis of optical fiber (3A) orthogonally, it is formed of a perpendicular plane (5a) that is an end plane of the optical fiber (3B) side and crosses axis of optical fiber (3A) orthogonally and an inclined plane (5a') that is inclined by angle (theta) to this and extends to the core body (1); and in addition, optical fiber (3B) is formed on only perpendicular planes (4b) and (5b) of end plane of optical fiber (3A) side of opposite side to that optical fiber (3A) side and cross axis of each optical fiber (3B) orthogonally; and therefore, when this is viewed as a whole, on an extended part of optical fiber (F) comprising optical fibers (3A) and (3B), a V-form cleavage (G) comprising a perpendicular plane (p) that is formed of part of perpendicular plane (5b) of optical fiber (3B) that crosses axis of that optical fiber (F) orthogonally and an inclined plane (r) by inclined plane (5a') of optical fiber (3A) that is inclined against this is formed with such depth that it reaches core body (1) of the optical fiber (F) from its outer circumference plane.

One constitutional example of the present invention is explained above; and according to said constitution, when value of angle (theta) that is formed with axis of optical fiber (3A) at inclined plane (5a') of optical fiber (3B) side of that optical fiber (3A) is selected to be as such (this may be of about 45° because core body (1) is generally made of glass, and shows about 45° critical angle) that is sufficient to grain a total reflection of the light that reaches inclined plane (5a') from inside of optical fiber (3A) beforehand, it is clear that with entrance of light (LO) into optical fiber (3A) from end plane side formed of perpendicular plane (4a) of the optical fiber (3A), part of that light is totally reflected at inclined plane (5a'), and

is guided out as light (L1) through clad layer (2) of the optical fiber (3A) while the other portion is guided as (L2) into the optical fiber (3B) through perpendicular plane (5a) of optical fiber (3A) and perpendicular plane (5b) of optical fiber (3B). Furthermore, the light (L1) that is guided outside in this case is collected as shown in Figure 3 by passing through the clad layer (2), and is guided outside. In addition, it is clear that when light (LO') enters from outside at the V-form cleavage (G) side toward inclined plane (5a') of the optical fiber (3A), almost all of that light (LO') is totally reflected at inclined plane (5a') and passes through perpendicular plane (5b) of optical fiber (3B) and is guided as light (L1') into the optical fiber (3B). Furthermore, in this case, when sectional plane of light (LO') happens to be greater than the size of opening end of v-form cleavage (G), part of such light is guided outside as (L2') by passing through clad layer (2) of the optical fiber (3A).

And therefore, when this is viewed as a whole, it provides function as light branch.connecting circuit by branching the incidental light (LO) is branched in such manner so part of said light (LO) that enters this optical fiber (F) from one end side of optical fiber (F) is reflected at inclined plane (r) of V-form cleavage (G) is guided out of optical fiber (F) while other portion surpass V-form cleavage (G) position and is guided to the other end side of the optical fiber each as (L1) and (L2) or connecting the light (LO') that enters from outside in direction toward inclined plane (r) of V-form cleavage (G) is reflected at inclined plane (r) and is guided to other end side of optical fiber (F) as (L1') with optical fiber (F). In this case, when depth of V-form cleavage (G) is varied, intensity of light (L1) and L2) which are branched based on incidental light (LO) may be varied.

According to the present invention, function as prescribed light branch.connecting circuit may be attained without excess or shortage without using lens or half mirror besides optical fiber as seen in the conventional light branch.connecting circuit explained above; and therefore, it shows a large feature that can eliminate the defects of conventional light branch.connecting circuit explained above with one sweeping action.

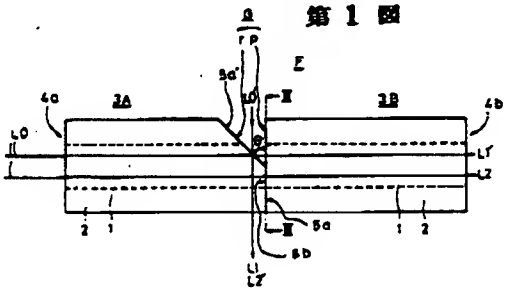
According to above explanation, constitution of entirety with two optical fibers (3A) and (3B) is explained, however, it is clear that above-explained V-form cleavage (G) may be formed on extended part by use of one optical fiber to provide identical functions.

BRIEF EXPLANATION OF THE FIGURES

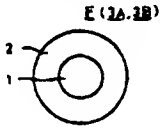
Figure 1 shows side view of one example of present invention's light branch.connecting circuit by use of optical fiber; and figure 2 shows end plane view of this; and Figure 3 shows end plane view of III-III line of figure 1.

In the Figures, 1 shows core body, 2 shows clad layer; and 3A, 3B, and F show optical fiber; and 4a, 5a, 5b, 4b; and p shows perpendicular plane; and 5a' and r show inclined plane; and G shows V-form cleavage.

第 1 図



第 2 図



第 3 図